

ABSTRACT

This invention provides heat transfer systems and methods of cooling surfaces and heating liquids which employ surfaces including a minimum density of discrete, nucleation sites having a conical cross-section tapering to a minimum predetermined depth. These surfaces are placed in contact with a refrigerant having a preselected boiling point so that the nucleation sites become largely flooded with the refrigerant. The nucleation sites permit nucleate boiling of a refrigerant without a temperature overshoot on the initial ascent. In more preferred variations of this invention, specific site spacing and geometries are employed to contain tiny bubble embryos, which minimize hysteresis and reversal of trend effects.

LIST OF REFERENCE NUMERALS

- 10 Chip
- 11 Module
- 12 Gold Film Contacts
- 14 Back Surface Thermocouple Locations
- 16 Insulated Copper Power Leads
- 17 Voltage Taps
- 18 T-Type Thermocouples
- 20 Felt Insert
- 22 Short Stainless Steel Tube
- 23 Cryogenic Adhesive
- 24 Fiberglass Insulation
- 26 Felt Insert
- 28 Cryogenic Adhesive
- 30 Specimen
- 32 RTV Silicon Adhesive/Sealant
- 33 Power Leads
- 34 Stainless Steel Sting
- 36 Pass-Throughs
- 37 Thermocouple Wires
- 39 Voltage Taps
- 42 Insulated Stainless Steel Tank
- 44 Vertical Immersion Heater
- 45 Bottom Plate
- 46 Thermocouples